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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,055	10/04/2007	Gerhard Kruse	740-81	5461

616 7590 12/17/2010

THE MAXHAM FIRM
9330 SCRANTON ROAD, SUITE 350
SAN DIEGO, CA 92121

EXAMINER	
YU, LIHONG	
ART UNIT	PAPER NUMBER
2611	
MAIL DATE	DELIVERY MODE
12/17/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/589,055	KRUSE, GERHARD	
	Examiner	Art Unit	
	LIHONG YU	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 October 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *20-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *20-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/04/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claim rejections under 35 USC 102 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claim 20, 22, 38, 40, 42, 46, 49 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1).

Consider claims 20 and 42:

Perahia discloses a method for operating MIMO air interfaces in mobile communication systems (see Perahia at the Abstract, where Perahia describes an invention for estimating a MIMO wireless communication channel), the method comprising:

- transmitting from a transmitting device a radio signal over a MIMO channel comprising a number of m sub channels, said radio signals each having a signal flow

path (see Perahia at col. 2, lines 8-25, where Perahia describes transmitting OFDM signals in the MIMO channel; see col. 1, lines 42-54, where Perahia describes the MIMO channel has multiple spatial sub-channels);

- receiving the radio signals in a receiving device (see Perahia at col. 2, lines 26-40, where Perahia describes receiving the OFDM signals);

- assigning different polarizations to the signals that are to be transmitted and received on the sub-channels (see Perahia atFig. 3 and col. 5, lines 6-15, where Perahia describes that a first spatial sub-channel is mapped to a horizontal antenna polarization and a second spatial sub-channel is mapped to a vertical antenna polarization);

- mutually conducting to an antenna the superimposed radio signals of all sub channels (see Perahia at Fig. 3 and col. 5, lines 6-15, where Perahia describes that the signals for the horizontal and vertical antenna polarizations are generated separately in parallel; see Fig. 1 and col. 4, lines 1—21, where Perahia describes that the horizontal and vertical polarizations may be from the same antenna), the antenna comprising several spatially closely adjacent partial antennas (see Perahia at Fig. 1 and col. 4, lines 1-34, where Perahia describes two antenna elements represent the horizontal and vertical polarizations of the same antenna, and the two antenna elements form two independent spatial sub-channels).

However, Perahia does not specifically disclose a polarization is assigned to each radio signal by inserting delay lines into the signal flow paths and thereby generating active

polarizations in said radio signals, and superimposing the differently polarized radio signals of all sub-channels.

In an analogous art, Erceg teaches a polarization is assigned to each radio signal by inserting delay lines into the signal flow paths and thereby generating active polarizations in said radio signals (see Erceg in Fig. 5 and paragraph 0050, where Erceg describes emulating cross-polarization of the multi-path signals; see Erceg in Fig. 5 and paragraph 0047, where Erceg describes the input signals are passed through phase shifters 512, 514, 516 and 518 in the signal paths, therefore delay lines), and superimposing the differently polarized radio signals of all sub-channels (see Erceg in Fig. 5 and paragraph 0051, where Erceg describes a set of output combiners 562, 564 and 566 that generate three MIMO channel output signals y1, y2 and y3; see Erceg in paragraph 0033, where Erceg describes the three outputs y1, y2 and y3 are representing antenna signals; see Erceg in paragraph 0004, where Erceg describes spatial multiplexing with multiple antennas).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that a polarization is assigned to each radio signal by inserting delay lines into the signal flow paths and thereby generating active polarizations in said radio signals, and superimposing the differently polarized radio signals of all sub-channels, as taught by Erceg, thus allowing for reducing the effects of multi-path fading, as discussed by Erceg (see Erceg in paragraph 0011).

Consider claim 22:

Perahia in view of Erceg discloses the method according to claim 20 above. Perahia discloses governing the assignment of the polarizations of the radio signals sent out on the sub channels by a control facility (see Perahia at col. 5, lines 5-15, where Perahia describes signals for the horizontal and vertical antenna polarizations are generated separately in parallel).

Consider claim 38:

Perahia in view of Erceg discloses the method according to claim 20 above. Perahia discloses determining the polarization of the signals sent out on the sub channels by the relationship of the amounts of its performances α and/or $(1-\alpha)$ and/or its mutual phase situation and/or its time offset (t_1, t_2) (see Perahia at col. 5, lines 5-15, where Perahia describes defining antenna element weights corresponding to the two spatial sub-channels).

Consider claim 40:

Perahia in view of Erceg discloses the method according to claim 20 above. Perahia discloses the polarizations are switchable and the number of switchable polarizations is at least as large as the number m of sub channels (see Perahia at col. 2, lines 15-25, where Perahia describes transmitting the first OFDM signal via a first antenna element while inhibiting transmission of the second OFDM signal via a second antenna element, and vice versa).

Consider claim 46:

Perahia in view of Erceg discloses the device according to claim 42 above. Perahia discloses said facilities comprise means to change the phase situation and/or the time delay (t) of the radio signals (see Perahia at Fig. 2 and col. 4, lines 45-53, where Perahia describes that

blocks 205 shift the frequency and phase of the received signal based on the measured offset for synchronization to local timing).

Consider claim 49:

Perahia in view of Erceg discloses the device according to claim 42 above. Perahia discloses said facilities comprise means for dividing the radio signal into several partial signals of various performance a and 1-a (see Perahia at col. 5, lines 5-15, where Perahia describes defining antenna element weights corresponding to the two spatial sub-channels used to transmit the signal).

Consider claim 52:

Perahia in view of Erceg discloses the device according to claim 42 above. Perahia describes a control facility to control the installations (see Perahia at Fig. 2 and col. 4, lines 45-50, where Perahia describes a controller 207).

4. Claims 21, 23, 39, 40, 43, 47, 50 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1), as applied to claims 20 and 42 above, and further in view of Shnitkin et al (US 3,836,973).

Consider claims 21 and 43:

Perahia in view of Erceg discloses the invention according to claims 20 and 42 above. Perahia discloses horizontal and vertical polarization of an antenna on two antenna elements (see

Perahia at col. 4, lines 1-34). However, Perahia does not specifically disclose the partial antennas have phase centers which coincide.

Shnitkin teaches partial antennas have phase centers which coincide (see Shnitkin at col. 9, lines 29-33 and col. 10, lines 1-3).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that the partial antennas have phase centers which coincide, as taught by Shnitkin, thus allowing for determining the polarization angle unambiguously, as discussed by Shnitkin (see Shnitkin at col. 4, lines 30-37).

Consider claim 23:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. Perahia discloses governing the assignment of the polarizations of the radio signals sent out on the sub channels by a control facility (see Perahia at col. 5, lines 5-15, where Perahia describes signals for the horizontal and vertical antenna polarizations are generated separately in parallel).

Consider claim 39:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. Perahia discloses determining the polarization of the signals sent out on the sub channels by the relationship of the amounts of its performances α and/or $(1-\alpha)$ and/or its mutual phase situation and/or its time offset (t_1, t_2) (see Perahia at col. 5, lines 5-15, where Perahia describes defining antenna element weights corresponding to the two spatial sub-channels).

Consider claim 40:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. Perahia discloses the polarizations are switchable and the number of switchable polarizations is at least as large as the number m of sub channels (see Perahia at col. 2, lines 15-25, where Perahia describes transmitting the first OFDM signal via a first antenna element while inhibiting transmission of the second OFDM signal via a second antenna element, and vice versa).

Consider claim 47:

Perahia in view of Erceg and Shnitkin discloses the device according to claim 43 above. Perahia discloses said facilities comprise means to change the phase situation and/or the time delay (t) of the radio signals (see Perahia at Fig. 2 and col. 4, lines 45-53, where Perahia describes that blocks 205 shift the frequency and phase of the received signal based on the measured offset for synchronization to local timing).

Consider claim 50:

Perahia in view of Erceg and Shnitkin discloses the device according to claim 43 above. Perahia discloses said facilities comprise means for dividing the radio signal into several partial signals of various performance a and 1-a (see Perahia at col. 5, lines 5-15, where Perahia describes defining antenna element weights corresponding to the two spatial sub-channels used to transmit the signal).

Consider claim 53:

Perahia in view of Erceg and Shnitkin discloses the device according to claim 43 above. Perahia describes a control facility to control the installations (see Perahia at Fig. 2 and col. 4, lines 45-50, where Perahia describes a controller 207).

5. Claims 24, 26, 27, 29 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1), as applied to claims 20 and 22 above, and further in view of Witte (US 3,603,987).

Consider claims 24 and 26:

Perahia in view of Erceg discloses the method according to claims 20 and 22 above. However, Perahia does not specifically disclose altering the polarizations of the signals sent out on the sub-channels in predetermined intervals of time.

In an analogous art, Witte teaches altering polarizations of the signals sent out on sub-channels in predetermined intervals of time (see Witte at col. 1, lines 40-49, where Witte describes polarization is switched on each pulse period).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to alter the polarizations of the signals sent out on the sub-channels in predetermined intervals of time, as taught by Witte, thus allowing for achieving polarization diversity, as discussed by Witte (see Witte at col. 1, lines 40-49).

Consider claims 27 and 29:

Perahia in view of Erceg discloses the method according to claims 20 and 22 above. However, Perahia does not specifically disclose synchronically altering the polarizations of the signal sent out on the sub-channels.

In an analogous art, Witte teaches synchronically altering polarizations of the signal sent out on sub-channels (see Witte at col. 1, lines 40-49, where Witte describes polarization is switched on each pulse period, therefore, the polarization switching is synchronized with timing of pulse).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to synchronically alter the polarizations of the signal sent out on the sub-channels, as taught by Witte, thus allowing for achieving polarization diversity, as discussed by Witte (see Witte at col. 1, lines 40-49).

Consider claim 32:

Perahia in view of Erceg discloses the method according to claim 20 above. However, Perahia does not specifically disclose assigning to each signal sent out on the sub channels a polarization selected by chance from a volume of predetermined polarizations.

In an analogous art, Witte teaches synchronically altering polarizations of the signal sent out on sub-channels (see Witte at col. 1, lines 40-49, where Witte describes that an arbitrarily selected polarization may be selected to be one of a choice of vertical, horizontal, right-hand circular or left-hand cicular).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to assign to each signal sent out on the sub channels a polarization selected by chance from a volume of predetermined polarizations, as taught by Witte, thus allowing for achieving polarization diversity, as discussed by Witte (see Witte at col. 1, lines 40-49).

6. Claims 25, 28, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1) and Shnitkin et al (US 3,836,973), as applied to claim 21 above, and further in view of Witte (US 3,603,987).

Consider claim 25:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. However, Perahia does not specifically disclose altering the polarizations of the signals sent out on the sub-channels in predetermined intervals of time.

In an analogous art, Witte teaches altering polarizations of the signals sent out on sub-channels in predetermined intervals of time (see Witte at col. 1, lines 40-49, where Witte describes polarization is switched on each pulse period).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to alter the polarizations of the signals sent out on the sub-channels in predetermined intervals of time, as taught by Witte, thus allowing for achieving polarization diversity, as discussed by Witte (see Witte at col. 1, lines 40-49).

Consider claim 28:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. However, Perahia does not specifically disclose synchronically altering the polarizations of the signal sent out on the sub-channels.

In an analogous art, Witte teaches synchronically altering polarizations of the signal sent out on sub-channels (see Witte at col. 1, lines 40-49, where Witte describes polarization is switched on each pulse period, therefore, the polarization switching is synchronized with timing of pulse).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to synchronically alter the polarizations of the signal sent out on the sub-channels, as taught by Witte, thus allowing for achieving polarization diversity, as discussed by Witte (see Witte at col. 1, lines 40-49).

Consider claim 33:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. However, Perahia does not specifically disclose assigning to each signal sent out on the sub channels a polarization selected by chance from a volume of predetermined polarizations.

In an analogous art, Witte teaches synchronically altering polarizations of the signal sent out on sub-channels (see Witte at col. 1, lines 40-49, where Witte describes that an arbitrarily selected polarization may be selected to be one of a choice of vertical, horizontal, right-hand circular or left-hand cicular).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to assign to each signal sent out on the sub channels a polarization selected by chance from a volume of predetermined polarizations, as taught by Witte, thus allowing for achieving polarization diversity, as discussed by Witte (see Witte at col. 1, lines 40-49).

7. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1), as applied to claim 20 above, and further in view of Poggiolini (US 5,127,066).

Consider claim 30:

Perahia in view of Erceg discloses the method according to claim 20 above. However, Perahia does not specifically disclose exchanging among each other in predetermined intervals of time the polarizations of the signals sent out on the sub channels.

In an analogous art, Poggiolini teaches exchanging among each other in predetermined intervals of time the polarizations of the signals sent out on sub channels (see Poggiolini at col. 1, lines 58-68 and col. 2, lines 1-10, where Poggiolini describes switching between two orthogonal polarization states at a frequency equal to four times the symbol frequency).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to exchange among each other in predetermined intervals of time the polarizations of the signals sent out on the sub channels, as taught by Poggiolini, thus

allowing for reducing signal fading, as discussed by Poggiolini (see Poggiolini at col. 1, lines 15-29 and col. 1, lines 58-67).

8. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1) and Shnitkin et al (US 3,836,973), as applied to claim 21 above, and further in view of Poggiolini (US 5,127,066).

Consider claim 31:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. However, Perahia does not specifically disclose exchanging among each other in predetermined intervals of time the polarizations of the signals sent out on the sub channels.

In an analogous art, Poggiolini teaches exchanging among each other in predetermined intervals of time the polarizations of the signals sent out on sub channels (see Poggiolini at col. 1, lines 58-68 and col. 2, lines 1-10, where Poggiolini describes switching between two orthogonal polarization states at a frequency equal to four times the symbol frequency).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to exchange among each other in predetermined intervals of time the polarizations of the signals sent out on the sub channels, as taught by Poggiolini, thus allowing for reducing signal fading, as discussed by Poggiolini (see Poggiolini at col. 1, lines 15-29 and col. 1, lines 58-67).

9. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1), as applied to claim 20 above, and further in view of Green et al (US 5,949,762) and Glance (US 4,723,316).

Consider claim 34:

Perahia in view of Erceg discloses the method according to claim 20 above. Perahia discloses sending the radio signals that are sent out on the MIMO channel , and modulating the radio signals sent out (see Perahia at Fig. 3 and col. 5, lines 5-27, where Perahia describes a MIMO transmitter system 300 with modulator 304).

However, Perahia does not specifically disclose (1), at least some of the radio signals are modulated and sent out by means of digital multithread, and (2), for the duration of at least one bit the polarizations of the signals sent out on the sub channels remain same.

Regarding item (1) above, Green teaches at least some of the radio signals are modulated and sent out by means of digital multithread (see Green at Fig. 4 and col. 10, lines 1-28, where Green describes a multithread digital signal processing for a modulation process).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that at least some of the radio signals are sent out by means of digital multithread, as taught by Green, thus allowing for improving system performance, as is known in the art.

Regarding item (2) above, Glance teaches that for the duration of at least one bit the polarizations of the signals sent out on the sub channels remain same (see Glance at col. 4, lines 37-63).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that for the duration of at least one bit the polarizations of the signals sent out on the sub channels remain same, as taught by Glance, thus allowing for phase synchronization, as discussed by Glance (see Glance at col. 4, lines 37-63).

10. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1) and Shnitkin et al (US 3,836,973), as applied to claim 21 above, and further in view of Green et al (US 5,949,762) and of Glance (US 4,723,316).

Consider claim 35:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. Perahia discloses sending the radio signals that are sent out on the MIMO channel , and modulating the radio signals sent out (see Perahia at Fig. 3 and col. 5, lines 5-27, where Perahia describes a MIMO transmitter system 300 with modulator 304).

However, Perahia does not specifically disclose (1), at least some of the radio signals are modulated and sent out by means of digital multithread, and (2), for the duration of at least one bit the polarizations of the signals sent out on the sub channels remain same.

Regarding item (1) above, Green teaches at least some of the radio signals are modulated and sent out by means of digital multithread (see Green at Fig. 4 and col. 10, lines 1-28, where Green describes a multithread digital signal processing for a modulation process).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that at least some of the radio signals are sent out by means of digital multithread, as taught by Green, thus allowing for improving system performance, as is known in the art.

Regarding item (2) above, Glance teaches that for the duration of at least one bit the polarizations of the signals sent out on the sub channels remain same (see Glance at col. 4, lines 37-63).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that for the duration of at least one bit the polarizations of the signals sent out on the sub channels remain same, as taught by Glance, thus allowing for phase synchronization, as discussed by Glance (see Glance at col. 4, lines 37-63).

11. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1), as applied to claim 20 above, and further in view of Green et al (US 5,949,762) and Marshall et al (US 5,090,025).

Consider claim 36:

Perahia in view of Erceg discloses the method according to claim 20 above. Perahia discloses sending at least some of the radio signals that are sent out on the MIMO channel (see Perahia at col. 2, lines 8-25, where Perahia describes transmitting OFDM signals in the MIMO channel); and modulating those radio signals (see Perahia at Fig. 3 and col. 5, lines 5-27, where Perahia describes a MIMO transmitter system 300 with modulator 304).

However, Perahia does not specifically disclose (1), modulating those radio signals by a digital multithread, and (2), the polarizations of the signals sent out on the sub channels change at least once during the duration of at least one bit of the signal.

Regarding item (1) above, Green teaches modulating those radio signals by a digital multithread (see Green at Fig. 4 and col. 10, lines 1-28, where Green describes a multithread digital signal processing for a modulation process).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to modulate those radio signals by a digital multithread, as taught by Green, thus allowing for improving system performance, as is known in the art.

Regarding item (2) above, Marshall teaches polarizations of signals sent out on sub channels change at least once during the duration of at least one bit of the signal (see Marshall at col. 1, lines 40-50, where Marshall describes one half of its duration of a bit is transmitted with one polarity and the next half of its duration of the bit is transmitted with the opposite polarity).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that the polarizations of the signals sent out on the sub channels change at least once during the duration of at least one bit of the signal, as taught by

Marshall, thus allowing for better timing, as discussed by Marshall (see Marshall at col. 1, lines 40-50).

12. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1) and Shnitkin et al (US 3,836,973), as applied to claim 21 above, and further in view of Green et al (US 5,949,762) and of Marshall et al (US 5,090,025).

Consider claim 37:

Perahia in view of Erceg and Shnitkin discloses the method according to claim 21 above. Perahia discloses sending at least some of the radio signals that are sent out on the MIMO channel (see Perahia at col. 2, lines 8-25, where Perahia describes transmitting OFDM signals in the MIMO channel); and modulating those radio signals (see Perahia at Fig. 3 and col. 5, lines 5-27, where Perahia describes a MIMO transmitter system 300 with modulator 304).

However, Perahia does not specifically disclose (1), modulating those radio signals by a digital multithread, and (2), the polarizations of the signals sent out on the sub channels change at least once during the duration of at least one bit of the signal.

Regarding item (1) above, Green teaches modulating those radio signals by a digital multithread (see Green at Fig. 4 and col. 10, lines 1-28, where Green describes a multithread digital signal processing for a modulation process).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to modulate those radio signals by a digital multithread, as taught by Green, thus allowing for improving system performance, as is known in the art.

Regarding item (2) above, Marshall teaches polarizations of signals sent out on sub channels change at least once during the duration of at least one bit of the signal (see Marshall at col. 1, lines 40-50, where Marshall describes one half of its duration of a bit is transmitted with one polarity and the next half of its duration of the bit is transmitted with the opposite polarity).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that the polarizations of the signals sent out on the sub channels change at least once during the duration of at least one bit of the signal, as taught by Marshall, thus allowing for better timing, as discussed by Marshall (see Marshall at col. 1, lines 40-50).

13. Claims 44, 48, 51 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1), as applied to claim 42 above, and further in view of Dent et al (US 6,181,920 B1).

Consider claim 44:

Perahia in view of Erceg discloses the device according to claim 42 above. However, Perahia does not specifically disclose the antenna is a cross dipole.

In an analogous art, Dent teaches an antenna that is a cross dipole (see Dent at col. 4, lines 1-12).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that the antenna is a cross dipole, as taught by Dent, thus allowing for a low cost transmission of polarized modulated signals, as discussed by Dent (see Dent at col. 2, lines 43-45).

Consider claim 48:

Perahia in view of Erceg and Dent discloses the device according to claim 44 above. Perahia discloses said facilities comprise means to change the phase situation and/or the time delay (t) of the radio signals (see Perahia at Fig. 2 and col. 4, lines 45-53, where Perahia describes that blocks 205 shift the frequency and phase of the received signal based on the measured offset for synchronization to local timing).

Consider claim 51:

Perahia in view of Erceg and Dent discloses the device according to claim 44 above. Perahia discloses said facilities comprise means for dividing the radio signal into several partial signals of various performance a and 1-a (see Perahia at col. 5, lines 5-15, where Perahia describes defining antenna element weights corresponding to the two spatial sub-channels used to transmit the signal).

Consider claim 54:

Perahia in view of Erceg and Dent discloses the device according to claim 44 above. Perahia describes a control facility to control the installations (see Perahia at Fig. 2 and col. 4, lines 45-50, where Perahia describes a controller 207).

14. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perahia et al (US 7,352,688 B1) in view of Erceg et al (US 2003/0050020 A1) and Shnitkin et al (US 3,836,973), as applied to claim 43 above, and further in view of Dent et al (US 6,181,920 B1).

Consider claim 45:

Perahia in view of Erceg and Shnitkin discloses the device according to claim 43 above. However, Perahia does not specifically disclose the antenna is a cross dipole.

In an analogous art, Dent teaches an antenna that is a cross dipole (see Dent at col. 4, lines 1-12).

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Perahia, and to have that the antenna is a cross dipole, as taught by Dent, thus allowing for a low cost transmission of polarized modulated signals, as discussed by Dent (see Dent at col. 2, lines 43-45).

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LIHONG YU whose telephone number is (571) 270-5147. The examiner can normally be reached on 8:30 am-7:00 pm Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lihong Yu/
Examiner, Art Unit 2611
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611